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of the set most favorable for accurate measurement was λ 4289.237 of titanium, 0.65 Å from λ 4289.885 of chromium. Measurements of this line from three different standards gave no difference larger than 0.001 Å and usually agreed exactly. It may be said, therefore, that the measurements have given no evidence whatever of a mutual repulsion between close lines when anomalous dispersion is active, such small apparent differences as were found being in the opposite direction.

The same lines were tested in the regular furnace spectrum under a dispersion of 1 mm. = 0.6 Å to see whether the presence of the strong chromium lines affected the wave-length of the close line of titanium and calcium. The latter were photographed with and without the mixture of chromium vapor. The calcium and one titanium line gave differences of 0.002 Å but these were opposite in direction and probably within the errors of measurement, while the other titanium line, closest of the three to a chromium line, agreed within 0.001 Å when titanium was used alone and when mixed with chromium.

The material in this investigation has been limited by the scarcity of suitable pairs of lines, as in addition to being separated by a small interval, the lines must be given strongly in the furnace spectrum and one of them must show high anomalous dispersion. The lines tested have filled these requirements and the measurements have at least shown no tendency toward a repulsion between such close lines under these conditions.

SYNTHESIS OF THE BASE $C_3H_4ON_2$ DERIVED FROM METHYL-AMINOMETHYL-3,4-DIHYDROXYPHENYLCARBINOL

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Some thirteen years ago Abel¹ found that when methylamino-methyl-3,4-dihydroxyphenylcarbinol, $3,4-(HO)_2C_6H_3CH(OH)CH_2NHCH_3$ (epinephrine, suprarenine, adrenaline, the substance known as the active principle of the medullary portion of the suprarenal capsules) is slowly added to nitric acid (density 1.2) an energetic reaction takes place and there are obtained as chief products oxalic acid and an unstable nitrogenous base in the form of a hygroscopic salt (probably the oxalate). With iodine trichloride this base gives a crystalline double compound which, although relatively stable, is also very hygroscopic, but with gold chloride is obtained a stable, beautifully crystalline chloroaurate. Abel analyzed this salt for carbon, hydrogen, nitrogen, gold and chlorine

and the remarkably concordant results of all his determinations seem to establish beyond doubt that its composition is represented by the formula $C_3H_4ON_2 \cdot AuCl_3 \cdot HCl$. The free base itself could not be isolated and all the evidence tends to show that it decomposes as soon as it is set free from its salts; when any of the latter are treated with alkaline reagents (even such weakly basic ones as calcium carbonate or acetate) a characteristic, unpleasant, coniine-piperidine-like odor develops and vapors which turn moist litmus paper blue are evolved; among the products formed when the gold salt is boiled with sodium hydroxide solution were identified ammonia, methylamine and methylhydrazine.

Since the base must be formed by the action of the nitric acid on the side chain $CH_3NHCH_2CH(OH)$ —of the epinephrine molecule, it seemed possible that it might also be obtained by treating methylaminoacetaldehyde, CH_3NHCH_2CHO , with nitric acid. Accordingly, methylaminoacetal, $CH_3NHCH_2CH(OC_2H_5)_2$, was prepared by heating under pressure chloroacetal, $ClCH_2CH(OC_2H_5)_2$, with an aqueous solution of one equivalent of sodium hydroxide saturated with methylamine, and was converted into the aldehyde by letting it stand overnight in concentrated hydrochloric acid; the solution was then concentrated *in vacuo* at 40° and finally at room temperature over sulphuric acid and solid sodium hydroxide. When the resulting syrup was treated with nitric acid there was obtained a substance agreeing in all respects with that described by Abel. It can also be prepared by treating the acetal directly with nitric acid, but in that case the reaction is very violent and even after it has apparently ceased sometimes starts again explosively and the whole product may be converted into a red tar. The synthetic base reduces ammoniacal silver nitrate and Fehling's solutions, evolves the characteristic coniine-piperidine odor with alkalies and gives with gold chloride a salt difficultly soluble in water and separating from acetone containing a little alcohol in beautiful yellow prisms containing the same percentages of gold and chlorine as Abel's salt.

0.2484 g. salt decomposed with 10% aqueous Na_2O_2 gave 0.1156 g. metallic Au and the filtrate gave 0.3370 g. $AgCl$.

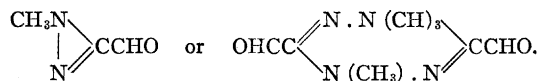
| | Found | Calculated for $C_3H_4ON_2 \cdot AuCl_3 \cdot HCl$ |
|----------|-------|---|
| Au | 46.54 | 46.49 |
| Cl | 33.56 | 33.44 |

When the gold salt is treated with sodium hydroxide solution and the mixture is distilled to a small volume the distillate is found to reduce Fehling's solution strongly, and the residue in the distilling flask, after being filtered from the gold and acidified with acetic acid, gives with

calcium chloride a crystalline precipitate soluble in hydrochloric acid and reprecipitated by ammonia.

The hydrochloric acid solution of the base, obtained by decomposing the water solution of the gold salt with hydrogen sulphide, gives with phenylhydrazine and potassium acetate at about 40° a reddish brown, partly crystalline, partly resinous solid, easily soluble in organic solvents (except ligroin), which, when dissolved in a little alcohol and poured into much boiling water, separates on cooling in fine felted needles melting at 159° when heated slowly and at 162–3° when the capillary is introduced into a bath previously heated to 150°.

With the data at his disposal Abel in 1903 suggested that the base might well be a highly unstable cyclic compound related to the pyrazolone series. In 1906 Curtius began publishing the results of his interesting investigations on the series of compounds obtained by the action of alkalis on diazoacetic ester,² and our new base in so many respects (namely, in its decomposition into methylhydrazine, methylamine, ammonia and oxalic acid) so closely resembles his 'pseudodiazoacetic acid' derivatives that it may not appear too hazardous to suggest that it contains the isodiazomethane or N-1,4-dihydro-1,2,4,5-tetrazine grouping and that its constitution may be represented by the formula



This suggestion is made with all reserve and it is hoped that certain experiments now being carried out will soon make it possible to decide whether or not it is tenable.

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¹Abel, J. J., *Amer. J. Physiol. Proc.*, 8, 31 (1903); *Ber. D. chem. Ges.*, 36, 1846 (1903); 37, 368 (1904); Abel and Taveau, R. deM., *J. Biol. Chem.*, 1, 13 (1905).

²For a summary of the work of Curtius on these compounds, see *Ber. D. chem. Ges.*, 41, 3161 (1908); also *Ibid.*, 42, 3284 (1909).

EXTINGUISHED AND RESURGENT CORAL REEFS

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In the diagrams by which Darwin originally illustrated his theory of upgrowing reefs on subsiding foundations, the reefs were drawn as growing upward and inward, in such a way that the diameter of their